Code: DE57   **Subject: NETWORKS & TRANSMISSION LINES**

DiplETE – ET (Current Scheme)

Time: 3 Hours   **DECEMBER 2018**   **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 **Choose the correct or the best alternative in the following:**   **(2×10)**

    a. Where is the ROC defined or specified for the signals containing causal as well as anti-causal terms Multiplication by e^{-s10} in the time domain
     (A) Greater than the largest pole
     (B) Less than the smallest pole
     (C) Between two poles
     (D) Cannot be defined

    b. Which result is obtained by the addition of a step to a ramp function
     (A) Step function shifted by an amount equal to ramp
     (B) Ramp function shifted by an amount equal to step
     (C) Ramp function of zero slop
     (D) Step function with zero slop

    c. Production of induced current in one coil due to production of current in neighbouring coil is
     (A) Electromagnetism   **(B)** Induction
     (C) Mutual induction   **(D)** Steady current

    d. Voltage across inductor is equals to time derivative of total
     (A) Outflux linkage   **(B)** Influx linkage
     (C) Capacitance   **(D)** Inductance

    e. According to Millman's Theorem, if there are n voltage sources with n internal resistances respectively, which are in parallel then these sources are replaced by?
     (A) Single current source I' in series with R'
     (B) Single voltage source V' in series with R'
     (C) Single current source I' in parallel to R'
     (D) Single voltage source V' in parallel to R'
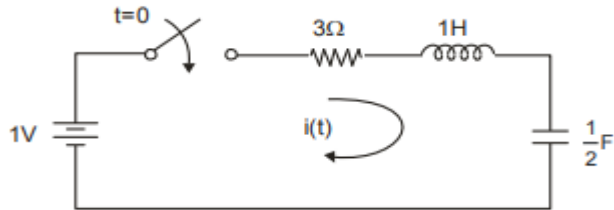
    f. An ideal voltage source should have
     (A) Large value of e.m.f   **(B)** Small value of e.m.f
     (C) Zero source resistance   **(D)** Infinite source resistance

g. When power cables laid in proximity of communication cables what is the minimum horizontal and vertical clearance for separation of these two cables?
   (A) 1.0 m   (B) 0.6 m
   (C) 2.4 m   (D) 4.0 m

h. A circuit is said to be selective if it has a _____ peak and ____ bandwidth.
   (A) Blunt, narrow   (B) Sharp, narrow
   (C) Sharp, broad   (D) Blunt, broad

i. Fourier transform of unit impulse at origin is
   (A) Undefined   (B) Infinity
   (C) Zero   (D) One

j. What is the Q factor of a selective circuit?
   (A) Very low   (B) Very high
   (C) Zero   (D) Infinity

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. For the circuit shown below solve for i(t) using Laplace transform with switch closed at t = 0. Assume zero initial conditions.   **(8)**
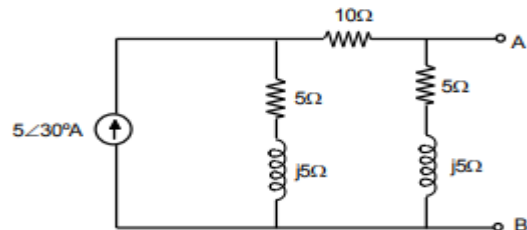

b. Derive and explain the linearity and shifting property of Laplace transform   **(8)**

Q.3 a. Obtained the Thevenin's and Norton's equivalent circuit across the terminals A-B for the circuit shown here.   **(8)**
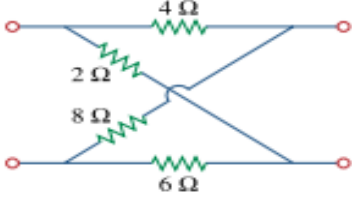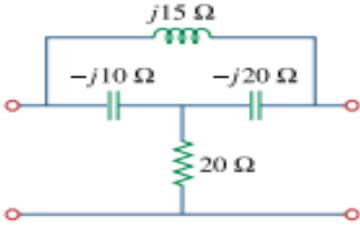

b. State and prove Reciprocity Theorem. and Maximum Power Transfer Theorem   **(8)**

Q.4 a. A condenser has one plate so rotated that the capacitance varies as shown in the following figure. A battery of constant voltage 10 volts is connected across the condenser. Find (i) current during time t = 0 to t = 1second. (ii) Charge accumulated across the condenser at t = 1 second (iii) power in the condenser at t = 1 second and (iv) energy stored in the condenser at t = 1 second.   **(8)**
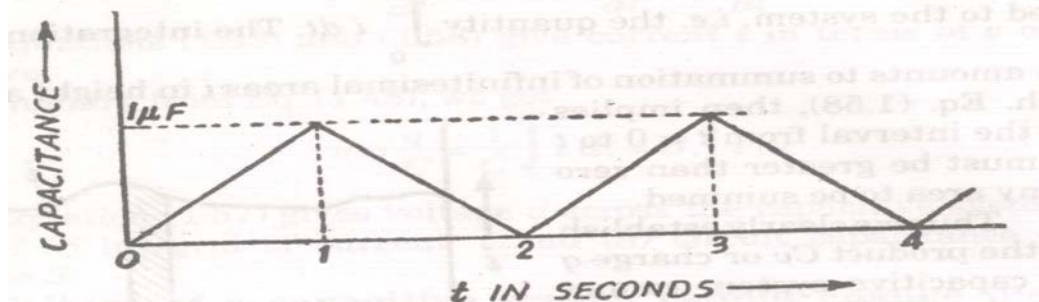
b. Explain transformation of energy sources using suitable Example. **(8)**

Q.5 a. Determine the z and y parameters for the given circuit **(8)**

b. Determine the transmission parameters of the circuit given here. **(8)**

Q.6 a. Compute the quality factor and damping factor of simple parallel R, L, C network **(8)** (all elements parallel to each other) for the following conditions and comment on Quality factor and damping factor.
  i) $R = 1\,k\,\Omega$, $C = 10$ mF and $L = 1$ H
  ii) $R = 1\,k\,\Omega$, $C = 1F$ and $L = 1$ H
  iii) $R = 1\,k\,\Omega$, $C = 100$mF and $L = 1$ H
  iv) $R = 1\,k\,\Omega$, $C = 100$mF and $L = 0.1$ mH
  v)

b. Derive the resonance frequency, Q factor and damping factor for series RLC circuit. **(8)**

Q.7 a A distortion less line operating at 120 MHz has $R = 20\ \Omega/m$, $L = 0.3\ \mu H/m$, and **(8)** $C = 63$ pF/m. (i) Determine γ, u, and Z_0 .(ii) How far will a voltage wave travel before it is reduced to 20% of its initial magnitude? (iii) How far will it travel to suffer a 45° phase shift?

b. Define transmission line coefficient and derive its formula in terms of Z_i and Z_0 **(8)**

Q.8 a. A lossless transmission line is 80 cm long and operates at a frequency of 600 Mhz. **(8)** The line parameters are $L = 0.25\ \mu H/m$ and $C = 100$ pF/m. Find the characteristics impedance, the phase constant, the velocity on the line and the input impedance for $Z_L = 100\ \Omega$

b. A distortion less line has $Z_0 = 60\Omega$, $\alpha = 20$mN/m, $u = 0.6c$.Where c is the speed **(8)** of light in vacuum Find R, L, G, C and λ at 100Mhz

Q.9 a. Give the classification of filters and explain each in brief. **(8)**

b. What is attenuator? Classify its types. An attenuator is composed of symmetrical T **(8)** – section having series arm of 175 Ω each and shunt arm of 350Ω. Find the characteristic equation and attenuation (in dB).